DMS-8220, Hot Applied Thermoplastic

Overview

(Formerly D-9-8220, Hot Applied Thermoplastic).

Effective Date: August 1998 – April 2003.

This specification shall govern for the materials, composition, quality, sampling, and testing of thermoplastic and materials utilized in its application to the roadway surface.

Bidders' and/or Suppliers' Requirements

Procurement by the State

All prospective bidders and/or suppliers are notified that, before any bid is considered, the manufacturer of the material proposed for submission shall have submitted a sample of thermoplastic to the Texas Department of Transportation, Construction Division, Materials & Pavements Section, Cedar Park Campus, Bldg. 51, 9500 Lake Creek Parkway, Austin, TX 78717 for evaluation.

This is to ensure that the manufacturer has the technical and production capabilities to produce a material conforming to the requirements of this specification.

Contracts

All contractors and/or suppliers are notified that all thermoplastic pavement marking material and other materials, utilized in the application of thermoplastic markings, shall be manufactured by a company who has previously submitted samples of the material to CST/M&P for evaluation.

This is to ensure that the manufacturer has the technical and production capabilities to produce a material conforming to the requirements of this specification.

Payment

Procurement by the State

Payment for all materials governed by this specification shall be in accordance with provisions in the purchase order awarded by the State.

Contracts

All materials governed by this specification utilized by the Contractor in contract projects will be paid for as prescribed in "Item 666, Reflectorized Pavement Markings" of the TxDOT *Standard Specifications for Construction of Highways, Streets, and Bridges*.

Sampling and Testing

Sampling and testing shall be in accordance with CST/M&P *Manual of Testing Procedures.*

Specific tests are normally indicated in conjunction with specific specification requirements. However, TxDOT reserves the right to conduct whatever tests are deemed necessary to identify component materials and verify results of specific tests indicated in conjunction with specification requirements.

Costs of sampling and testing are normally borne by TxDOT; however, the costs of sampling and testing of materials failing to conform to the requirements of this specification shall be borne by the contractor or supplier.

Costs of sampling and testing of failing material shall be assessed at the rate established by the Director of CST/M&P in effect at the time of testing.

Amounts due TxDOT for conducting such tests shall be deducted from monthly or final estimates on contracts or from partial or final payments on direct purchases by the State.

Material Requirements

Thermoplastic pavement marking material shall be a product especially compounded for traffic markings for use on either asphaltic or Portland cement concrete surfaces.

- Each bag shall be clearly marked to indicate color, weight, and lot or batch number (a lot or batch shall be considered as each individual mix or blend that produces a finished product ready for use).
- Each bag shall contain 22.7 kilograms (50 pounds) of material.
- The bag shall be composed of a material that allows it to be put with its contents into the melter for use.
- Notification shall be given to CST/M&P if production lots exceed 2000 kilograms (4,500 pounds).

Pigments

Prime and filler pigments shall, when washed free of resins by solvent washing, pass a U.S. Standard Sieve Number 200, (Test Method "Tex-863-B, Determining Material Characteristics of Thermoplastic Pavement Marking Material") and shall meet the following specific requirements for each pigment.

- Prime Pigments
  - The white pigment shall be a Rutile Titanium Dioxide.
  - The yellow pigment shall be a heat resistant medium chrome yellow or other approved heat-resistant pigment.
- Filler Pigment

- The filler pigment shall be calcium carbonate of 95 percent purity.

Binder

The binder shall consist of a mixture of resins, at least one of which is a solid at room temperature, and high boiling point plasticizers.

At least 1/3 of the binder composition shall be a maleic-modified glyceryl ester of rosin and shall be no less than eight (8) percent by weight of the entire material formulation.

The infrared analysis of the resin extract shall match the spectra on file at CST/M&P in accordance with Test Method "Tex-888-B, Obtaining the Infrared Spectrum of Organic Materials."

Silica

The total silica used in the formulation shall be in the form of glass traffic beads.

Glass Traffic Beads

Drop-on beads shall meet the requirements of Departmental Material Specification "DMS-8290, Glass Traffic Beads."

The glass traffic beads used in the formulation shall meet the following requirements:

- Manufacture
  - Manufactured from glass
  - Spherical in shape
  - Essentially free of sharp angular particles
  - Essentially free of particles showing milkiness, surface score, or surface scratching
  - Water-white in color
- Contaminants
  - Contain less than ¼ of one (1) percent moisture by weight
  - Be free of trash, dirt, etc.
  - Show no evidence of objectionable static electricity when flowing through a regular traffic bead dispenser
- Gradation
  - Sieve Analysis Test Method "Tex-831-B, Determining the Gradation of Glass Traffic-Stripe Beads."

Sieve Analysis, Glass Traffic Beads Gradation Requirements		
Openings Micrometers	**(U.S. Standard Sieves)**	**Percent Passing**
850	(No. 20 Sieve)	100
600	(No. 30 Sieve)	80 - 95

300	(No. 50 Sieve)	15 - 35
150	(No. 100 Sieve)	0 - 4

- Irregular Particles – Glass traffic beads, retained on any screen used to determine gradation requirements, shall not contain more than 30 percent (by weight) irregular particles measured by Test Method "Tex-832-B, Determining the Roundness of Glass Spheres."

♦ Index of Refraction

- Glass traffic beads, when tested by the liquid immersion method at 25 °C (77 °F), shall show an index of refraction within the range of 1.50 to 1.53.

♦ Wetting

- Glass traffic beads shall be capable of being readily wet with water when tested in accordance with Test Method "Tex-826-B, Water Absorption Test of Beads."

♦ Stability

- Glass traffic beads shall show no tendency toward decomposition, surface etching, change in retroreflective characteristics, or change in color after:

Glass Bead Stability Test
One (1) hour exposure to concentrated hydrochloric acid at 25 °C (77 °F)
Twenty-four (24) hours exposure to weak alkali
One hundred (100) hours of Weather-Ometer (Atlas Sunshine Type) exposure, ASTM G 23, Method 1, Type EH.

Finished Product Requirements

Physical Characteristics

Unless otherwise specified, the finished thermoplastic pavement marking material shall be a free flowing granular material.

The material shall remain in the free flowing state in storage for a minimum of six months when stored at temperatures of 38 °C (100 °F) or less. The material shall be readily sprayed through nozzles commonly used on thermoplastic spray equipment at temperatures between 205 and 218 °C (400 to 425 °F).

Toxicity

At temperatures up to and including 230 °C (446 °F), materials shall not give off fumes which are toxic or otherwise injurious to persons, animals, or property.

Material Stability

The material shall not break down or deteriorate when temperatures are held at 205 °C (400 °F) for four hours.

Temperature versus Viscosity Characteristics

The temperature versus viscosity characteristics of the material in the plastic state shall remain constant throughout up to four (4) reheatings to 205 °C (401 °F) and from batch to batch.

Chemical Resistance

The material shall not be adversely altered by contact with sodium chloride, calcium chloride, or other similar chemicals on the roadway surface; by contact with the oil content of pavement materials; or by contact from oil dropping from traffic.

Softening Point

The materials shall not soften at 90 °C (194 °F) when tested by the Ball and Ring Method, ASTM E 28.

Color

The CIE chromaticity coordinates of the material, when determined in accordance with Test Method "Tex-839-B, Determining Color in Reflective Materials," shall fall within an area having the following corner points:

CIE Chromaticity Coordinate Corner Points

	1		2		3		4		Brightness
	x	y	x	y	x	y	x	y	Y
White	.290	.315	.310	.295	.350	.340	.330	.360	Min. 65
Yellow	.470	.455	.510	.489	.490	.432	.537	.462	45-60

The white and yellow material shall meet the above specified color requirements, for each color, before and after 70 hours of exposure in a Weather-Ometer (Atlas, Sunshine-Type) fitted with an 18-102 (18 minutes of sunshine and rain and 102 minutes of sunshine) cyclic gear. Panels for testing shall be prepared with material as supplied.

Abrasion

Thermoplastic pavement marking material shall have a loss between 4.0 and 12.0 grams when tested for abrasion in accordance with Test Method "Tex-851-B, Evaluating the Abrasion Resistance of Pavement Marking Material," according to steps one (1) through eight (8) of the procedure using the following test parameters:

Abrasion Resistance Test Parameters

Test	Parameter
Test Distance	127 millimeters (five inches)
Blast Pressure	275 kilopascals (40 psi)
Sample Angle	10 degrees
Blast Media	1200 grams

Uniformity

Material shall be manufactured such that, when sampled in accordance with CST/M&P *Manual of Testing Procedures*, any 100-gram sample will be representative of the batch or lot of material.

Formula

- Thermoplastic Marking Material

Thermoplastic Marking Material			
White	**Percent by Weight**	**Yellow**	**Percent by Weight**
Binder	18 – 23	Binder	18 – 23
Titanium Dioxide	12 – 15	Medium Chrome Yellow	10 – 15
Calcium Carbonate	20 – 42	Calcium Carbonate	20 – 42
Glass Traffic Beads	30 – 45	Glass Traffic Beads	30 – 45
Total	100	Total	100

NOTE*:* The above requirements shall be determined by testing in accordance with Test Method "Tex-863-B, Material Characteristics of Thermoplastic Pavement Marking Material."